

HASTINGSIA ATROPURPUREA
(LILIACEAE: ASPHODELEAE), A NEW SPECIES FROM
SOUTHWESTERN OREGON

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ABSTRACT

Hastingsia atropurpurea Becking was discovered recently along the slopes of the Woodcock and Tennessee Mountains in southwestern Oregon. It is distinguished from *Hastingsia bracteosa* by a distinct, dark purple perianth, larger bulb size, larger and more robust scape, longer and wider, more glaucous leaves, shorter and more branched racemes, larger number of veins in the leaves, shorter floral and inflorescence bracts, and greater density of flowers in the raceme. It is sympatric with *H. bracteosa* only at three isolated localities, where there is no evidence of hybridization.

An unusual collection of *Hastingsia* (Liliaceae: Asphodeleae) was made in June 1982, in conjunction with a survey of the status of *H. bracteosa*, an endangered species. Between 1983 and 1985, further explorations revealed considerable range extensions of this unknown plant. In 1984, 22 specimens were collected and deposited in major herbaria, and herbarium materials of *Hastingsia* species from many institutions were studied. These studies resulted in the distinction of a new species, which is supported by statistical analysis.

***Hastingsia atropurpurea* Becking, sp. nov.**

Herba typice plerumque alterioris; scapus unus per annum, 71–99 cm altus; racemibus terminalibus, 20–70 floribus, erectibus, solitaribus, non rarifer ramificantibus. Bulbus oblongatus vel infrequenter ovatus, grandioris; 28–54 mm longus, 18–30 mm latus. Folia graminifolia, glauco-virida, 25–55 cm longi, 6–12 mm lati. Sepala vel corolla atropurpurea cum vena centralis pallida virida, 9–12 mm longi, 2 mm lati, lanceolata, acuminata. Capsula oblonga. Fig. 1.

Perennial herbs typically more robust than *Hastingsia bracteosa*. Scape single, arising from the top of the bulb, 71–99 cm tall. Bulb oblong or infrequently more oblong-ovate; 28–54 mm long and 18–30 mm wide; bulb scales light brownish, fleshy, densely packed forming the bulb; bulb with a blackish exterior tunica consisting of hardened dried vein remnants. Terminal raceme 20–70 flowered, erect, solitary; often the scape is branched below the terminal raceme with 1 to 3 shorter lateral ascending racemes. Leaves distinctly grass-like, deeply to distinctly keeled or V-shaped, bluish-green, glabrous,

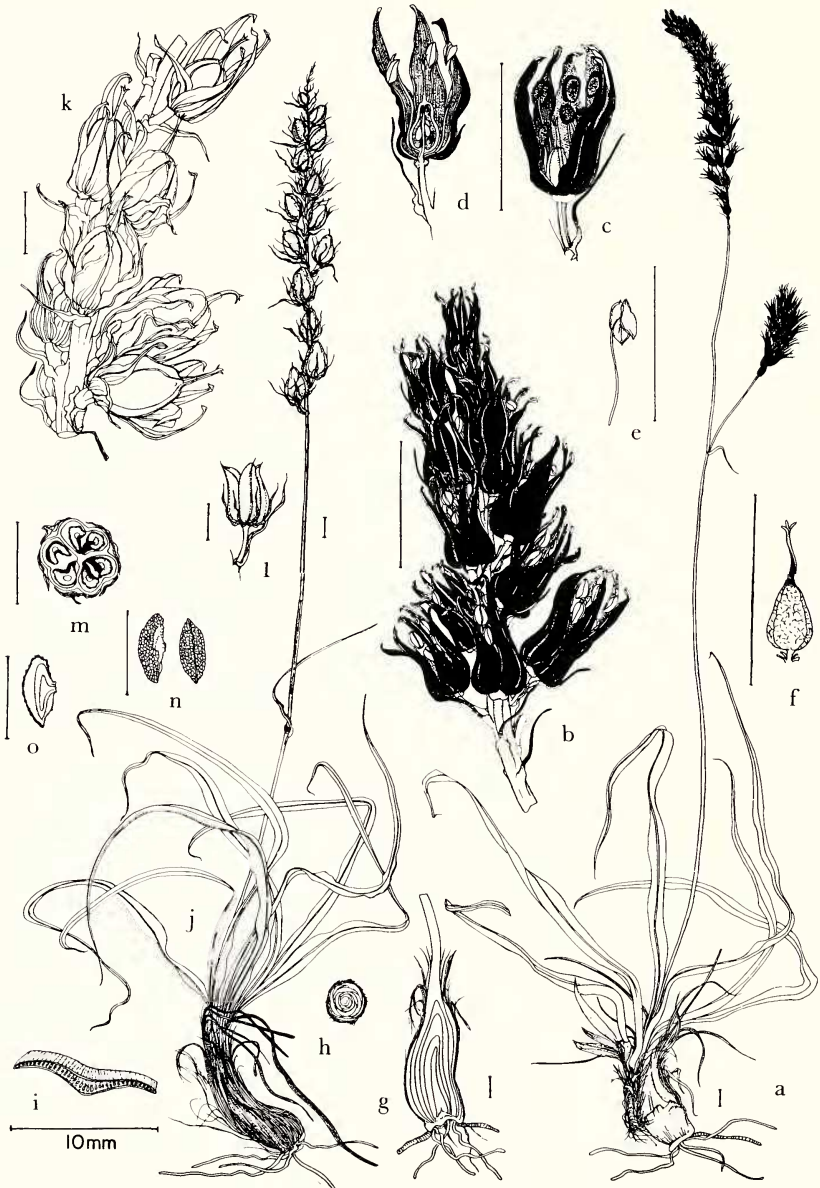


FIG. 1. *Hastingsia atropurpurea*. a. Flowering plant. b. Top of flowering raceme. c. Flower. d. Lengthwise cross section of flower. e. Stamen. f. Pistil. g. Lengthwise cross section of bulb. h. Cross section of bulb. i. Cross section of leaf blade. j. Fruiting plant. k. Part of fruiting raceme. l. Capsule. m. Cross section of capsule. n. Seeds. o. Lengthwise section of seed. All bar scales are 10 mm long.

25–55 cm long and 6–12 mm wide. Mature plants often have abundant dead, blackish, and shriveled foliage persisting at the base of the scape at soil level. Sepals and petals lanceolate, 9–12 mm long, 2 mm wide, erect and forming a closed perianth, trinerved, purple-black with a pale green central vein; discoloring often in herbarium specimens to dark purple; each perianth segment narrowing into a flattened and triangular tip, whitish in color with minute dense stiff hairs along the tip margins. Capsule oblong to oblong-ovate, broadly 3-lobed and slightly constricted $\frac{1}{3}$ below its top, 2 seeds per locus. Seed fusiform, elongate with two laterally flattened sides, shiny, black with irregular reticulation on the rounded surface.

TYPE: OR, Josephine Co.: O'Brien, Woodcock Mt., *Darlingtonia* bog, T39S R8W S31 se. $\frac{1}{4}$, 123°41'48"W, 42°7'29"N, 1520 ft. elev., 4 Jul 1984. R. W. Becking 840700. (Holotype: CAS; isotypes: CAS, DS, GH, HSC, ORE, OSC, PUA, RSA, SOC, UBC, US.) The most typical fruiting specimen is *Becking 840700(14)* (CAS).

PARATYPES: OR, Josephine Co.: Woodcock Mt., 24 Jun 1982, *Becking 820658* (HSC); Woodcock Mt., 17 Jun 1982, *Becking 820633* (HSC); Canyon Creek, 5 Jul 1984, *Becking 840723* (HSC); Mikes Gulch, 3 Jul 1984, *Becking 840706* (HSC); Upper Josephine Creek, 30 May 1985, *Becking 850551* (CAS, HSC, UBC); Parker Creek, 28 May 1985, *Becking 850540* (CAS, HSC, OSC, UBC); Canyon Creek, 29 May 1985, *Becking 850546* (CAS, HSC, OSC, UBC); Josephine Creek, Cutlers Cabin, 5 Jul 1984, *Becking 840727* (CAS); Upper Josephine Creek, 6 Jul 1984, *Becking 840730* (HSC); Canyon Creek, 8 Jul 1984, *Becking 840740* (CAS, RSA); Woodcock Mt., 4 Jul 1984, *Becking 840712, 840713* (HSC, RSA); Woodcock Mt., Mendenhall Creek, 5 Jun 1985, *Becking 850608* (CAS); Eight Dollar Mt., USFS Road No. 3843 bridge, 17 Jun 1982, *Becking 820600* (CAS).

Distinction between species. The distinctions between *Hastingsia atropurpurea* and *H. bracteosa* are readily observed in the field, even on mature sterile plants. These differences are summarized in Table 1. No evidence for hybridization between *H. atropurpurea* and *H. bracteosa* has been observed.

Hastingsia atropurpurea (dark purple) can be separated from *H. bracteosa* (yellowish white) by the distinctive perianth color and its more glaucous leaves. Flower color is very distinctive in the Liliaceae. In the Tribe Asphodeae to which *Hastingsia* belongs, flower color has been used as the simplest and most reliable difference between *Schoenolirion croceum* (yellow) and *Schoenolirion wrightii* (white) (Sherman 1969). In *Chlorogalum*, a closely related genus, flower color is used to distinguish *Chlorogalum purpureum* (purple) and *C. parvifolium* (white). *Hastingsia bracteosa* and *H. atropur-*

TABLE 1. DISTINCTIONS BETWEEN *Hastingsia atropurpurea* AND *H. bracteosa*. All characters listed had significant differences at the 0.01 probability level by t-test analysis. 1. Leaf length, leaf width and leaf vein number were measured on 2-3 undamaged leaves at about the middle of the leaf length to establish the range of these characters. 2. Floral bracts support individual flowers. 3. Inflorescence bracts support raceme branches. 4. Density of flowers is the number of flowers per 10 cm raceme length. Most often, counts per 5 cm lengths were executed and converted per 10 cm lengths. The most dense and least sparse (open) raceme portions were selected for counting the range of flower density.

	<i>Hastingsia atropurpurea</i> Mean \pm s.e. (sample size)	<i>Hastingsia bracteosa</i> Mean \pm s.e. (sample size)
Bulb length	41.1 \pm 12.5 mm (44)	34.6 \pm 8.4 mm (38)
Bulb width	24.4 \pm 6.1 mm (44)	21.0 \pm 5.7 mm (38)
Scape length	801.9 \pm 186.9 mm (55)	655.3 \pm 217.2 mm (45)
Scape base	3.3 \pm 0.8 mm (57)	2.8 \pm 0.8 mm (46)
Dead leaves	usually present	often absent
Leaf length ¹		
Max	439.9 \pm 111.0 mm (62)	381.8 \pm 141.3 mm (45)
Min	372.6 \pm 118.0 mm (62)	314.1 \pm 129.4 mm (43)
Leaf width ¹		
Max	9.8 \pm 1.8 mm (62)	6.7 \pm 1.4 mm (45)
Min	8.4 \pm 1.7 mm (62)	5.8 \pm 1.3 mm (43)
Leaf vein number ¹		
Max	27.4 \pm 4.0 (62)	23.0 \pm 3.6 (43)
Min	24.2 \pm 3.9 (62)	20.3 \pm 3.5 (43)
Floral bract ²		
Length max	7.2 \pm 2.3 mm (57)	8.7 \pm 2.9 mm (48)
Inflor. bract ³		
Length min	16.1 \pm 8.4 mm (44)	21.5 \pm 7.5 mm (33)
Ovary color	dark purple (46)	dark gray-green (45)
Capsule style	2.5 \pm 0.5 mm (26)	2.1 \pm 0.3 mm (12)
Capsule color	purplish-green	gray to yellow-green
Raceme branches	1.7 \pm 1.3 (44)	1.0 \pm 1.0 (36)
Density flowers ⁴		
Max	36.1 \pm 6.9 (42)	30.0 \pm 6.7 (36)
Min	30.3 \pm 6.9 (42)	24.7 \pm 7.4 (36)

purea can be separated from *H. alba* by their closed, more campanulate perianth with filaments distinctly shorter than the perianth.

Statistical analysis. Discriminant Analysis (Wilkinson Lambda; Nie et al. 1975) was used to test classification of 62 herbarium specimens of *Hastingsia atropurpurea* and 50 specimens of *H. bracteosa*. Some 47 different quantitative and 8 qualitative characters were measured or assessed; all specimens with one or more missing characters were excluded from the Discriminant Analysis. The re-

TABLE 2. DISCRIMINANT ANALYSIS RESULTS USING SPECIMENS OF *Hastingsia atropurpurea* AND *H. bracteosa*. Key: *H. a* and *H. b* = *Hastingsia atropurpurea* and *H. bracteosa*, respectively; % = percent of correct classification; *r* = canonical correlation coefficient; # = number of significant characters used. Total number of specimens is 112.

Character group tested in discriminant analysis	Number of specimens		%	<i>r</i>	#
	<i>H. a</i>	<i>H. b</i>			
Bulb, scape, foliage, flower, and raceme	21	20	100	0.999643	14
Scape, foliage, flower, and raceme	28	23	100	0.985042	14
Bulb, scape, foliage, capsule, and seed	11	6	100	0.993476	9
Scape, foliage, capsule, and seed	14	7	100	0.998970	13

sults are summarized in Table 2. The segregations of the two species were highly effective (Canonical $r = 0.985042$ to 0.999643) and 100% correct classification occurred, with 9–14 characters selected as highly significant.

The t-test analysis was applied to the 112 available specimens and the 55 quantitative or qualitative characters selected for comparison at the individual character level. The significant characters were identified (Table 1). In addition, some 20 characters were examined and were found to have no significant differences: max/min petal length and width, long and short filaments, ovary length and width, ovary stalk, ovary style, max/min capsule length and width, raceme openness and density, and max/min seed length and width.

Distribution and ecology. The ranges of *Hastingsia atropurpurea* and *H. bracteosa* do not overlap (Fig. 2), with only a few exceptions. Both species are limited almost exclusively to ultramafic rock formations (Borine 1983, Ramp 1979), and both usually grow on open, sunny, and continuously wet sites. *Hastingsia bracteosa* is common only on Eight Dollar Mt. near Selma, Oregon. It occurs elsewhere, however, at the mouth of Josephine Creek and the lower parts of Mikes Gulch, Days Gulch, and Fiddler Gulch. It has been observed only in *Darlingtonia californica* bogs. *Hastingsia atropurpurea* is common on Woodcock Mt. near O'Brien, Oregon, on Tennessee Mt., and the middle and upper parts of the Josephine Creek watershed. Along the east bank of Josephine Creek opposite the mouth of Fiddler Gulch, however, both species occur together in limited numbers in a small *Darlingtonia* bog. This bog is utilized as a source of spring water and is grazed intensively. Here, both species occur along the small creek that is shaded heavily by *Chamaecyparis lawsoniana* (A. Murr.) Parl.

Herbarium specimens of *H. atropurpurea* have been collected in the past in two isolated locations. In 1932, Applegate collected a single specimen on Eight Dollar Mt. [Applegate 7266 (DS)]. Two

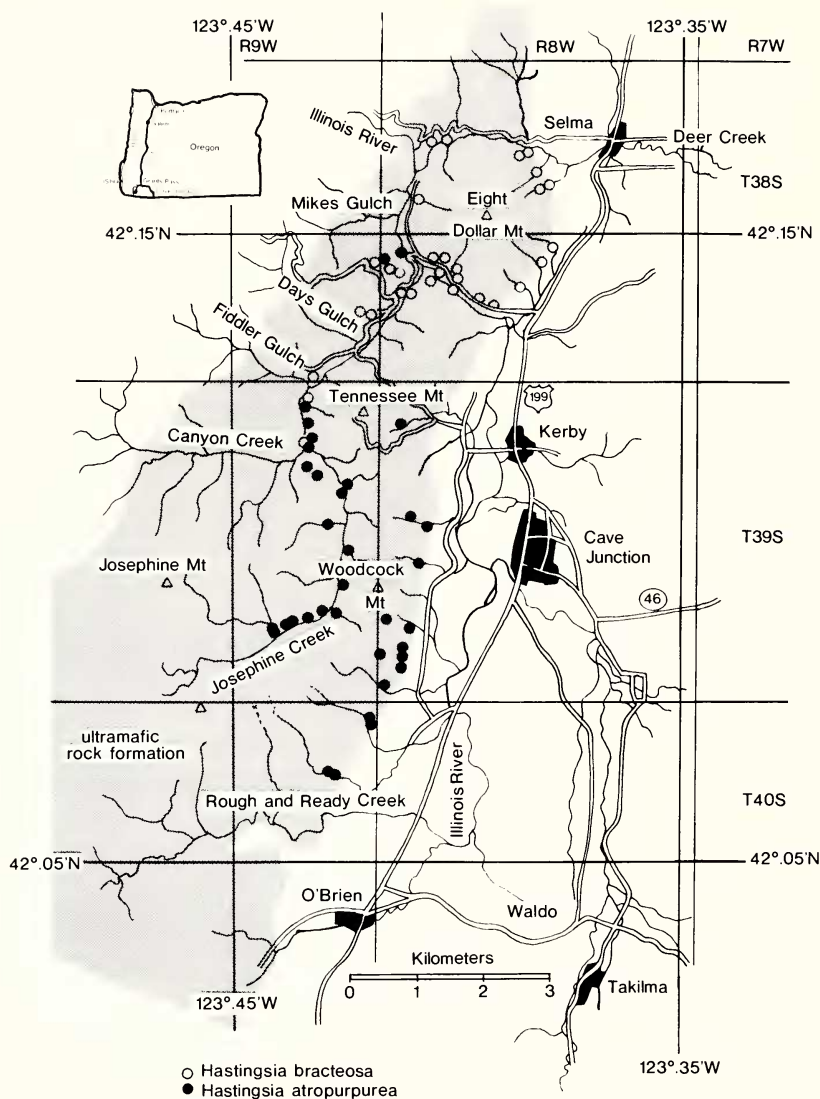


FIG. 2. Distribution map for *Hastingsia atropurpurea* and *Hastingsia bracteosa* near Cave Junction, southwestern OR.

other specimens were collected at a marsh along Josephine Creek [25 Jun 1930, *L. Leach s.n.* (OSC); 25 Jun 1930, *J. R. Leach 2968* (ORE)]. All three specimens were labeled *H. bracteosa*.

My first collection of *H. atropurpurea* was from another specimen from an isolated locality. This specimen was found in the rocky flood

plain of the Illinois River [17 Jun 1982, *Becking 820600* (CAS)]. In 1984, a few additional specimens of *H. atropurpurea* were collected in the Mikes Gulch area, immediately uphill from this latter collection site [3 Jul 1984, *Becking 840706* (HSC)].

Recommendation. *Hastingsia bracteosa* is listed as an endangered species (U.S. Fish and Wildlife Service, 1980). The same endangered species status should be given to *H. atropurpurea* because of its equally restricted distribution and sensitive habitat, which is threatened by mining and grazing.

ACKNOWLEDGMENTS

I am grateful for the excellent cooperation of the directors of many herbaria (CAS, DS, GH, HSC, JEPS, ORE, OSC, PUA, ROPA, RSA, SOC, UBC) for their hospitality during visits and the loan of herbarium specimens. I thank Dr. F. Raymond Fosberg (US), the reviewers, and the editor for constructive comments. I also thank Six Rivers National Forest, Eureka, CA; Siskiyou National Forest, Grants Pass and Cave Junction, OR; and the Bureau of Land Management, Medford, OR for logistical support and unpublished information. Valuable field assistance by James M. Lenihan and Esteban Muldavin and computer assistance by Steven A. Harris is acknowledged. A complete listing of measurements and specimen data is available upon request.

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(Received 4 Mar 1985; revision accepted 16 Apr 1986.)